

# Eye Injuries: Recent Data and Trends in the United States

## Introduction

Eye injury is a significant health problem in the United States, second only to cataract as a cause of visual impairment. Each year more than 2.5 million eye injuries occur and 50,000 people permanently lose part or all of their vision. **Ninety percent (90%) of all eye injuries can be prevented by using protective eyewear.**

The American Academy of Ophthalmology (Academy) and the American Society of Ocular Trauma (ASOT) track eye injuries annually through an effort called Eye Injury Snapshot (EIS), part of the EyeSmart™ Campaign to raise awareness of eye disease, eye injury and eye infection. Ophthalmologists, pediatricians and emergency room doctors from all regions of the United States report on the eye injuries they treat during a one-week period of time, the “snapshot” period. The EIS data presented here were averaged from the 2004–2008 snapshot periods. This information is also consistent with longer-term trend data compiled by the United States Eye Injury Registry. In this backgrounder EIS facts are compared with American perceptions about eye injuries identified in a recent public survey by Greenberg, Quinlan, Rosner Research for the Academy and ASOT.

## Who is at greatest risk for an eye injury?

### The Facts:

- Adults: Nearly half (47.6 percent) of all reported eye injuries occur in people between the ages of 18 and 45
- Children: 25.4 percent of injuries occur in children and youth 0 to 18 years old
- Older Adults: 26.9 percent of injuries occur in people age 46 and older
- Males are at greater risk than females for all age groups: 73 percent of injuries occur in males
- Americans of Caucasian, African and Hispanic ethnicity sustain 95.2 percent of injuries, compared with 2.5 percent for Asian Americans and 3.3 percent for other ethnic groups

### Public Perceptions vs. the Facts:

- Most people consider themselves unlikely to suffer an eye injury, even though 29 percent of survey respondents had already had a serious eye injury or knew someone who had
- Women, especially married mothers and younger women, understand the risks for their family members more clearly than the public in general; men, especially younger or “blue collar” men, are more likely to see themselves at risk
- Most people assume that eye *diseases* are more significant threats to eye health than injuries, yet the public also underestimates their risks for the major eye diseases according to other surveys commissioned by the Academy
- Few survey respondents noted elders as an at-risk group

## Where are eye injuries likely to occur?

### The Facts:

- Home: Nearly half (44.1 percent) of all reported injuries happen in the home
- Sports: 14.7 percent of reported injuries happen during sports or recreational activities

- Work: 15.6 percent of reported injuries occur in an industrial, factory or office setting
- Roads: 11.4 percent of reported injuries happen on a street or highway, usually in relation to motor vehicle accidents
- The remaining 14.2 percent of reported injuries took place in schools, farms or other, unspecified locations

**Public Perceptions vs. the Facts:**

- People tend to think eye injuries happen “elsewhere”---to people performing high risk construction work or sports---rather than during every day, home-based activities
- Americans fail to identify accidental slips and falls in the home as significant causes of eye injury, but the data show this is often how young children and elders are injured
- Schools and youth sports are not recognized as locations and activities that are significant for eye injury

**What are the causes of eye injuries?**

**The Facts:**

- Projectile objects such as flying debris or nails: 17.9 percent of all reported injuries
- Blunt objects like construction hand tools or hardware: 13.3 percent of reported injuries
- Fingers, fists or other body parts: 10.6 percent of reported injuries
- Sharp objects such as a wood splinter, fishhook or glass shard: 9.2 percent of reported injuries

**Public Perceptions vs. the Facts:**

- Only half (50 percent) of survey respondents report wearing protective eyewear when doing home or yard maintenance tasks. Though fireworks are responsible for *less than one percent* of all eye injuries, most respondents identify fireworks as the third leading cause of injury

**Cause of Injury**

|                                 |        |
|---------------------------------|--------|
| Projectile                      | 17.9 % |
| Blunt object                    | 13.3 % |
| Finger, fist, body (elbow, etc) | 10.6 % |
| Sharp object                    | 9.2 %  |
| Sports equipment                | 4.5 %  |
| Automobile airbag               | 4.4 %  |
| Paintball, bb gun, pellet gun   | 3.5 %  |
| Furniture/ appliance            | 2.1 %  |
| Household chemical              | 2.0 %  |
| Firearm                         | 1.9 %  |
| Fireworks                       | 0.68 % |
| Other                           | 15.8 % |
| Unknown                         | 5.0 %  |

## **Prevention of Eye Injuries**

**Ninety percent (90%) of all eye injuries can be prevented by using protective eyewear.** The Academy and ASOT recommend that every household have at least one pair of American National Standards Institute (ANSI)-approved eyewear to be used by anyone doing home or yard projects. Bystanders should be aware that they are also at risk and need to take appropriate precautions to prevent being injured. For more information about eye injuries and prevention, go to [www.geteyesmart.org](http://www.geteyesmart.org)

## **Sports and Recreation**

Injuries occur when sports equipment---such as a basketball, hockey puck, or paintball---strikes the eye, or when players in the heat of competition elbow each other or collide, or when players crash into goal posts or other features of the playing field. Protecting the eyes is especially important when the sport object is small enough to enter the eye rather than strike the bony eye socket and/or when it is projected at high velocity (i.e. baseball, golf ball, or fishhook). Athletes and parents of youth sports participants should look for protective eyewear that meets standards specific to their sport as certified by the American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), National Operating Committee on Standards for Athletic Equipment (NOCSAE), or Hockey Equipment Certification Council (HECC). A label that explains certification and related safety information should be attached to the eyewear.

## **Fireworks**

More than 1,500 eye injuries fireworks-related eye injuries occur each year, according to the U.S. Consumer Product Safety Commission (2006 report). Children and youth under age 20 sustain 47 percent of these eye injuries, and males of all ages are three times more likely to be hurt than females. Although most eye injuries are contusions or lacerations of the treat-and-release variety, serious and devastating injuries also occur.

Firecrackers were associated with the greatest number of injuries, the report found. Sparklers accounted for one-third of the injuries to children under five years old. Rockets and bottle rockets were related to more than three-quarters of the most serious injuries. Bystanders are at real risk of injury within 100 feet of fireworks and ideally should be at least 500 feet away. Viewing a public fireworks display is by far the safest choice parents can make for their children; in 2006, fewer than 100 injuries were related to public fireworks displays nationwide.

## **Automobile Accidents**

Although airbags in automobiles have helped reduce overall injuries and fatalities by 32 percent since they were introduced in the 1970s, airbag deployment itself can cause eye injury, with an estimated annual incidence of 5 percent. However, eye injuries related to airbags tend to be less severe than in vehicles without airbags, or when an airbag does not deploy. Seatbelt use is very important, whether or not the vehicle is equipped with airbags. The EIS data shows that 42.6 percent of people whose eyes were injured in automobile accidents were not wearing seatbelts. A separate 2007 study found that when seatbelts were used in vehicles with airbags, less severe eye injuries occurred and vision recovery was better. Earlier studies showed that airbag effectiveness was associated with the driver being seated properly, about an arm's length from the steering wheel.

## Treatment of Eye Injuries

With medical care, most people recover from eye injuries. EIS 2004 – 2008 summary data indicates the following:

|                      |                                  |                                 |
|----------------------|----------------------------------|---------------------------------|
| Full Recovery: 75.9% | Mild-Moderate Impairment: 16.9 % | Legally or Totally Blind: 7.0 % |
|----------------------|----------------------------------|---------------------------------|

**Superficial injuries:** the most common eye injuries are minor scrapes (abrasions), cuts or tears (lacerations), or other irritations that affect only the surface of the eye---the conjunctiva, sclera, or cornea. The conjunctiva is the clear mucus membrane that covers the surface of the eye except for the cornea; the sclera is the tough, white outer layer of the eyeball that begins at the edges of the cornea and surrounds the eyeball to the edges of the optic nerve at the back of the eye; the cornea is the clear tissue in the front of the eye that focuses light to form images on the retina at the back of the eye. The following 2008 EIS data shows how often each of these three eye areas was involved in an injury, and the percentage of superficial injuries within the categories:

| Eye Area - Percent of All Injuries | Within Injury Category, Percent Superficial |
|------------------------------------|---|
| Cornea - 50.3 %                    | 43.8 % (abrasion)                           |
| Conjunctiva - 48.9 %               |   |
| Sclera – 8.3 %                     | 50.0 % (laceration)                         |

When a superficial eye injury occurs, the person might experience pain, the feeling of having something in the eye, decreased vision, redness in the “white” of the eye, or a white spot in the eye’s normally clear surface. When treating a superficial injury, the Eye M.D. would remove any foreign debris or object, apply medicated eye drops and (rarely) a “pressure eye patch”, provide instructions for care at home, and schedule a follow-up visit if needed. If treated promptly, infection can usually be avoided, the eye will heal in a few days, and vision will return to normal.

**Other eye injury percentages from EIS 2008 data** (injuries often involve more than one area)

|                    |        |
|--------------------|--------|
| Eyelids            | 38.3 % |
| Anterior chamber   | 30.1 % |
| Retina             | 18.3 % |
| Orbit (eye socket) | 15.4 % |
| Iris               | 14.1 % |
| Vitreous           | 13.5 % |
| Lens               | 11.4 % |
| Optic nerve        | 7.9 %  |

More serious eye injuries, including descriptions of the eye parts involved, are described here.

Corneal injuries: This category includes superficial scratches and irritations (described above) and more significant foreign object injuries. In the more serious cases, usually the patient knows that an object, such as a wood or metal chip, has flown into the eye, and symptoms like pain, tearing, redness and sensitivity to light cause him/her to seek treatment. The Eye M.D. first determines whether the object is on the surface or inside the eye, often by using fluorescent eye drops and a slit

lamp. Sometimes a computer tomography (CT) is ordered. The doctor will remove the foreign object and may prescribe antibiotic drops or ointment to prevent infection. Recovery of normal vision typically occurs within a few days.

Anterior chamber hyphema: A blow from or collision with a blunt object often results in an anterior chamber hyphema, which is an eye emergency that requires immediate treatment. Blood enters the front, or anterior, chamber of the eye, and the inside of the eyeball may appear partially or completely filled with blood. The Eye M.D. will check for eye pressure and screen patients of certain ethnicities for sickle cell trait, which can complicate hyphema. Treatment may include dilating and steroid eye drops to lower inflammation as well as pressure-lowering drops. Usually the blood is reabsorbed by the body. Surgery to remove the blood may be needed if the hyphema is large and lasts more than five to 10 days, if the cornea is stained by blood, or if eye pressure cannot be controlled by medication. The anterior chamber often also becomes inflamed during an eye injury; this condition is called iritis and may be treated with medication.

Vitreous hemorrhage: The vitreous is a gel-like substance that fills the back (posterior) chamber of the eye and helps give the eyeball its shape. When this area of the eye is injured, bleeding may fill the posterior chamber, the back area of the eye, and obscure vision. The blood may be naturally reabsorbed by the body over time, or may require surgical intervention such as vitrectomy (described in the retinal injury section).

Retinal Injury: Injury can result in a retinal tear or detachment. The retina is a piece of thin tissue at the back of the eye that is sensitive to light, like a piece of camera film. It receives images from the front of the eye and relays them to the brain. At the center of the retina is the area crucial for detailed, central vision: the macula. When the retina is torn, fluid can enter and accumulate under it, so that it no longer sits on the back wall of the eye. Prompt treatment of a retinal tear is needed to prevent macular detachment in particular, as this can cause permanent loss of central vision. Symptoms of a torn retina include flashes of light or “floaters” which look like moving spots on the field of vision. The person may also see a dark grey “curtain” closing in from any side of the visual field.

Repair surgery depends on the extent of the injury. The edge of a tear may be sealed with a laser or cryotherapy (freezing). Reattaching the retina may be accomplished by:

**Pneumatic retinopexy**: cryotherapy followed by a bubble of gas injected into the eye to hold the mended retina in place.

**Scleral buckle**: a silicone band is placed around the eye to indent the wall of the eye and push the retinal tear closed.

**Vitrectomy**: the vitreous jelly is removed and the retina is reattached by removing the fluid from beneath the retina. A gas bubble, which dissolves over days or weeks, may be injected to hold the retina in place.

Retinal surgery is successful 80 to 85 percent of the time; some patients require more than one surgery. Glasses are almost always needed to attain optimal vision.

Iris: this is the pigmented tissue lying behind the cornea that gives color to the eye and controls the amount of light entering the eye by varying the pupillary opening.

Lens: the transparent tissue within the eye (behind the iris) that helps light rays focus on the retina.

Optic nerve: the nerve that conducts images from the retina to the visual processing area at the back of the brain.

### **If an Eye Injury Occurs: What People Need to Know**

When an eye injury occurs, an Eye M.D. or other medical doctor should examine the eye as soon as possible, even if the injury seems minor at first. A serious eye injury is not always immediately obvious. Delaying medical attention can cause the damaged areas to worsen and could result in permanent vision loss or blindness.

#### **For all eye injuries:**

- DO NOT touch, rub or apply pressure to the eye.
- DO NOT try to remove the object stuck in the eye.
- Do not apply ointment or medication to the eye.
- See a doctor as soon as possible, preferably an ophthalmologist.

#### **For a cut or puncture wound:**

- Gently place a shield over the eye. The bottom of a paper cup taped to the bones surrounding the eye can serve as a shield until you get medical attention.
- DO NOT rinse with water.
- DO NOT remove the object stuck in eye.
- DO NOT rub or apply pressure to eye.
- Avoid aspirin, ibuprofen or other non-steroidal, anti-inflammatory drugs. These drugs thin the blood and may increase bleeding.
- After protecting the eye, see a physician immediately.

#### **For a particle or foreign object in the eye:**

- DO NOT rub the eye.
- Lift the upper eyelid over the lashes of your lower lid.
- Blink several times and allow tears to flush out the particle.
- If the particle remains, keep your eye closed and seek medical attention.
- For sand or small debris, use eyewash to flush the eye; if the debris remains, lightly bandage the eye and visit an Eye M.D. or emergency room

#### **For a chemical burn:**

- Immediately flush the eye with plenty of clean water
- Seek emergency medical treatment right away.

**For a blow to the eye:**

- Gently apply a small cold compress to reduce pain and swelling.
- DO NOT apply any pressure.
- If a black eye, pain or visual disturbance occurs even after a light blow, immediately contact your Eye M.D. or emergency room. Even a light blow can cause a significant eye injury.

**Sources:**

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- United States Consumer Product Safety Commission 2006 Fireworks Report